

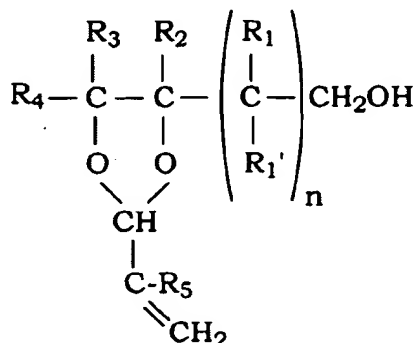
at least one photoinitiator to initiate radiation cure of the oligomer.

Claim 54 reads as follows:

54. A radiation curable resin composition, containing essentially no volatile organic components, comprising the reaction product of:

(a) at least one polyester prepolymer which comprises the reaction product of

(1) at least one substituted vinyl dioxolane monomer having the formula



wherein  $R_1$  and  $R_{1'}$  are independently hydrogen or an alkyl group having from 1 to 10 carbon atoms,  $n$  is a number from 0 to about 10, and  $R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  are independently hydrogen or an alkyl group having from 1 to about 10 carbon atoms; and

(2) at least one

- (i) ester of a polycarboxylic acid; or
- (ii) hydroxy-functional acrylate; or
- (iii) at least one isocyanate or polyisocyanate; or
- (iv) at least one isocyanate-endcapped aliphatic or aromatic urethane prepolymer, and

(b) at least one photoinitiator to initiate UV or visible light cure of the composition.

Claim 58 reads as follows:

58. A method of providing a radiation curable polymer coating, the method comprising applying a radiation curable resin composition containing essentially no volatile organic components and enabling radiation cure of the resin composition, wherein the radiation curable resin comprises:

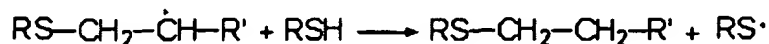
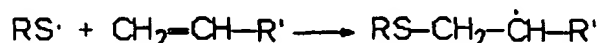
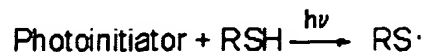
at least one one vinyl dioxolane end-capped oligomer, and at least one photoinitiator to initiate radiation cure of the composition.

U.S. Patent No. 3,301,693 (the '693 patent) describes cyclic acetal coating compositions. The '693 patent does not describe or otherwise suggest radiation curable compositions or the addition of photoinitiators to such compositions to initiate radiation cure of the compositions in accordance with Applicants' claimed invention.

U.S. Patent No. 5,945,488 (the '488 patent) describes compositions comprising reactive adducts of vinyl-dioxo compounds. The '488 patent does not describe or otherwise suggest radiation curable compositions or the addition of photoinitiators to such compositions to initiate radiation cure of the compositions in accordance with Applicants' claimed invention.

U.S. Patent Nos. 4,157,421 and 4,182,848 (the '421 and '848 patents) are related patents that describe photocurable compositions. In particular, the '421 and '848 patents describe "thiol-ene cures" of polymers, which is the cure of polymers by radiation induced addition of thiol functions to carbon-carbon unsaturation. (Col. 1, lines 7-10) Thus, according to the '421 and '848 patents, the thiol component is used for the cure.

UV cure is typically achieved by either a thiol-ene cure or by an acrylate cure. In the thiol-ene cure, a thiol functional silicone is reacted with a vinyl functional silicone. In particular, the reaction is a chain reaction that proceeds by a step-growth addition mechanism which is propagated by a chain transfer reaction involving the thiol radical (RS•) as follows:



According to the present invention, on the other hand, a photoinitiator is added to a vinyl dioxolane endcapped oligomer and radiation cure of the oligomer can be accomplished in two different ways:

- (1) the vinyl dioxolane ring remains intact and the vinyl group is polymerized
- (2) the vinyl group is polymerized while opening the vinyl dioxolane ring.

Thus, while the '421 and '848 patents describe compositions requiring thiols to accomplish a thiol-ene cure, the present invention describes compositions comprising vinyl-dioxolane endcapped oligomers and photoinitiators without the use of thiols. The coatings of the present invention are made from different starting materials and are formed by different curing mechanisms providing benefits not achieved by the cited references.

Further, according to Applicants' claimed invention, the radiation curable composition contains essentially no volatile organic components. As set out by Applicants:

Conventional curable resins are typically solvent-based and contain volatile organic components (VOCs). VOCs favorably affect the viscosity of curable resins, and often VOCs are added so as to make the curable resin composition sprayable. This is a particularly desired quality for coating applications (e.g. furniture, automobile, ship, aircraft and other transportation vehicle coating applications). However, during the application and cure of these conventional resin compositions, substantial amounts of VOCs are released into the atmosphere. This is a serious problem because VOCs are toxic, flammable, explosive, smog-producing and noxious. As a result, elaborate and expensive fire and explosion-prevention measures, worker protection measures and pollution control equipment are required during the use of such conventional resins. (page 1, line 30 – page 2, line 7)

While attempts have been made to formulate curable compositions containing low VOCs, it is believed that prior to the present invention these attempts have been unsuccessful and have resulted in compositions that are unsprayable, that require elevated cure temperatures, and that are unsatisfactory in adhesion, moisture resistance and other properties. The references discussed herein do not teach or suggest how to achieve radiation curable compositions containing essentially no VOCs.

Applicants have been able to successfully form radiation curable compositions that contain essentially no VOCs, that can be applied by spraying, that do not require elevated cure temperatures and that provide excellent adhesion and moisture resistance.

The '421 and '848 patents, on the other hand, as set out above, describe thiol-ene cure. Further, the '421 and '848 patents describe compositions that utilize soluble volatile solvents. For example, as set out in the Examples, volatile organic solvents (methyl ethyl ketone) in the amount of 62 parts by weight are added to the compositions. (See table of Example 5). The '421 and '848 patents do not describe or teach a photocurable composition that contains no or essentially no volatile organic components and, further, the '421 and '848 patents do not teach that such a composition can be formed and, if so, how.

Accordingly, it is respectfully submitted that the present claims are patentable over the U.S. Patent No. 3,301,693, No. 5,945,488, No. 4,157,421 and No. 4,182,848, alone and in combination. Specifically, each and every element as set forth in the claims is not found, either expressly or inherently described, in the references as required to establish anticipation. *Verdegel Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Further, (1) there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings as required by Applicants' claims; (2) there is no reasonable expectation of success and (3) the reference (or references when combined) do not teach or suggest all the claim limitations as required to establish a *prima facie* case of obviousness. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). MPEP 2142.

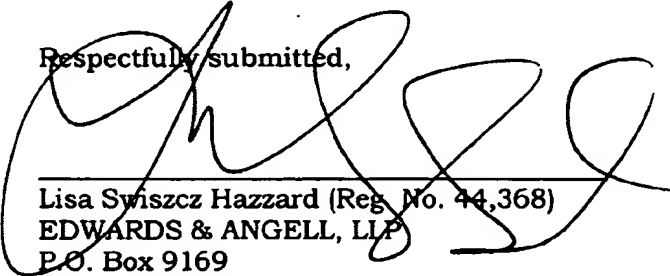
**CONCLUSION**

Allowance of the claims is respectfully requested in view of the foregoing discussion. This case is believed to be in condition for immediate allowance. Applicants respectfully requests early consideration and allowance of the subject application.

Applicants believe that no extension of time is required since this response is being filed before the expiration of the specified time period. Applicants, however, conditionally petition for an extension of time to provide for the possibility that such a petition has been inadvertently overlooked and is required. As provided below charge Deposit Account No. **04-1105** for any required fee.

Should the Examiner wish to discuss any of the amendments and/or remarks made herein, the undersigned attorney would appreciate the opportunity to do so.

Respectfully submitted,



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